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We Have Missed a Term in the Gender-Equity Hamiltonian

Why is female participation in Jordan as high as 90% in physics?

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After decades of APS efforts promoting gender equity in physics, female participation remains disappointingly low in the USA and other developed countries. However, new data bring hope and a challenge: Female participation in physics is improving globally and, in some countries, participation far exceeds (my) expectations. But what key factor have we missed in the USA, Japan, and similar countries that other countries have recognized?

We are missing a term in the *gender-equity Hamiltonian*, and my hope for this article is to rejuvenate a global discussion. Too often we ignore international comparisons that could offer insights into social phenomena—from science policy to vaccination acceptance—perhaps because the comparisons are painful.

The new data came to me from the fount of insight, Carlos Henrique de Brito Cruz, Senior Vice President of Elsevier Research Networks. Brito distinguished himself as a researcher, professor, and philanthropist before moving to Elsevier (Oxford) in 2020 where he studies research and funding trends. He forwarded to me a study¹ described below that gets to the heart of the matter. It is up to our community to interpret and act on the data!

In 2015 I became aware of a missing gender term thanks to a Jordanian physics graduate student at New Mexico State University whom I will call “Hala.” At the annual Physics Department picnic, I asked Hala about the status of physics in Jordan. I was fascinated by the SESAME² synchrotron project, its users, and staffing. “What are the barriers to bringing women and girls into physics in Jordan? SESAME must be an incentive, no?” Mentally referencing my American stereotype, I expected a woeful tale of gender inequity. Hala reported, “It’s the guys I worry about. Women represent 90% of the physicists in Jordan!”

Periodically I encounter confirmation that physics in Middle Eastern countries is dominated by female practitioners. Hala pointed out that many Jordanian women enter physics to teach rather than to pursue research. This notion impressed me as a refined motivation and one that in no way discounts the high female participation. Why is it that very few “developed” countries can claim even a third of Jordan’s participation rate?

The “Gender Lens” report¹ sent by Brito benchmarks equity trends in research for 15 scientific-powerhouse countries. Admittedly it misses small countries like Jordan and the physics teaching cadre of our community, and it misses China and India. With those caveats in mind, here is a synopsis.

While life sciences enjoy substantially equal gender participation, physical sciences are dead last. In Physics & Astronomy [2014-2018], Japan lags with only 8 women per 100 men, followed by Denmark (17), Netherlands (18), and the USA (19). (By this scale, the USA has 16% female participation.) On the brighter side, Argentina has 50 women participating in physics per 100 men (33% female participation) followed closely by Portugal (47) and Brazil (41).

The research publication inequities found in the Gender Lens report are mirrored in grants awarded and patents, which portend run-away career barriers not easily overcome.

Within the physical sciences, only Argentina and Portugal, the top countries for female participation, reached gender parity at all but only in three areas: Chemistry, Chemical Engineering, and Environmental Science. Mathematics and Computer Science are actually worse than Physics.

Good news! Over two decades [1999-2018], all 15 countries studied in the Gender Lens report improved in gender equity, but in physics the strides were modest. For example, the USA improved from 12 to 19 women per 100 men (11% to 16%). More good news, there is solid evidence that younger women are having greater impact with time.

We should recognize progress in these promising trends—helped by APS programs such as the Committee on the Status of Women in Physics³—but it is not yet time to declare victory!

The superb Gender Lens study pulls apart many of the factors we need to understand in order to diagnose the problem in science gender equity. Physics requires much work. We don't need to focus in all academic departments or to fortify certain pipelines. One area (Nursing) could even use a push toward more men!

However, the Middle East region teaches us that we are missing something in the USA and elsewhere. More exploration of the Hilbert space would be useful, in my opinion, if it is extended toward international differences. A study that includes China, the Middle East, and India, while taking into account societal drivers, might reveal the missing term in our gender equity Hamiltonian.

1. The Researcher Journey Through a Gender Lens, M. de Kleijn, B. Jayabalasingham, H.J. Falk-Krzesinski, et al, Elsevier B.V. (2020).
<https://sdgresources.relx.com/reports/researcher-journey-through-gender-lens> (accessed on August 31, 2021).
2. SESAME, Light for Experimental Science and Applications in the Middle East, <https://www.sesame.org.jo/> (accessed on August 31, 2021).
3. APS Committee on the Status of Women in Physics, <https://aps.org/programs/women/resources/statistics.cfm> (accessed August 31, 2021)